

The American X-Ray Journal

A JOURNAL OF
Progressive Therapeutics

Electrical Science

X-Ray Photography

Electro Therapy

Radio Therapy

Photo Therapy

Thermo Therapy

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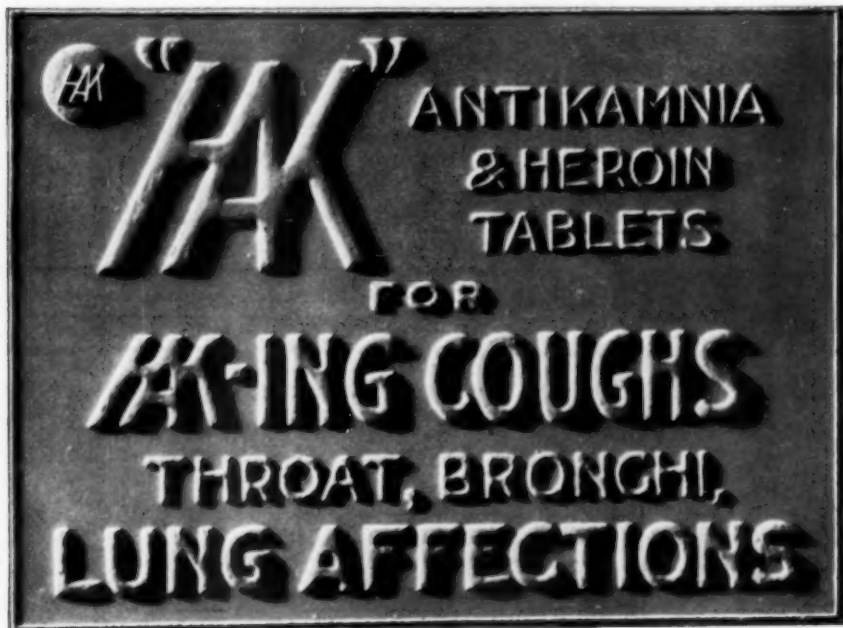
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THE AMERICAN X-RAY JOURNAL

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CONTENTS.

	PAGE		PAGE
Frontispiece. Dr. Carl Beck.....	34	Electrical Typewriters.....	52
Principles of Electro Therapy, by H. Preston Pratt.....	35	New System of Wireless Telegraphy... ..	43
The Medico-Legal Value of the Roentgen Rays, by Mihran K. Kassabian.....	39	The Telephone as a News Vendor.....	60
Dangers to the X-Ray Operator, by John T. Pitkin.....	44	Hydro Therapy in Insanity.....	60
Electro Therapy, Lesson 9. Static Currents.....	48	Colonic Lavage.....	61
Two Cases of Severe X-Ray Necrosis Presenting Unusual Features, by Clarence Edward Skinner.....	50	Radium as a Generator of Electricity..	61
Suggestion in its Relation to Electrical Applications.....	53	Radium.....	61
NEWS AND NOTES.		X-Ray in Eye Diseases.....	61
A Trip Eastward.....	52	Light Therapy in Eye Diseases.....	62
Copies of X-Ray Journal Wanted.....	52	Protection Against Roentgen Rays....	62
		X-Ray Prize Essays.....	62
		The Degenerate Tonsil.....	62
		Removal of a Nickel from Esophagus.	63
		Electricity for Blepharospasm.....	63
		Effects of Radium on Mice.....	63
		The "Iron Light" in Radio Therapy... ..	63
		Jail for Doctor and Nurse.....	63
		Prohibition of Exhibitions of Hypnotism	63
		Finsen Light Treatment.....	64
		High Frequency Currents for Phthisis..	64
		Radium in Medicinal Springs.....	64
		A Singing Vacuum Tube.....	64

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DR. CARL BECK.

One of the first Physicians in the World to treat Sarcoma with the X-Ray.

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No. 2

Principles of Electro-Therapy.*

BY H. PRESTON PRATT, M. D.
CHICAGO, ILL.

The discovery and study of the Roentgen ray and radium has thrown more light on and gives us a better idea and conception of the constitution of matter than all other experiments and discoveries put together since the time of Gilbert. It has assisted us materially in the study and development of electro therapy. It has developed the electron theory, which gives us clearer conception of the relationship of electricity to matter, thereby partially explaining the association theory.

Faraday believed that there was no flow of currents over the wire but that motion was imparted to the polarized molecules of the conductor. Berzelius after him classified fifty-six of the eighty odd elements in relation to their electrical activity, he believing that every molecule was a magnet or the equivalent of one. In this classified list, oxygen was considered the strongest electro-negative while potassium was the strongest electro-positive.

The one fluid theory was first suggested by Sir William Watson and afterward elaborated by Dr. Benjamin Franklin. Shortly afterward followed the two-fluid theory of Robert Symmer. Lodge suggested that all matter consists of two kinds of electricity, a positive and a negative charge interwoven and composing what is known as the ether.

The number of theories advanced are as numerous as the letters of the alphabet. So far no theory has thrown much light on the subject. All physicists up to the electronic epoch seem to agree that all electrical conditions of the atoms are transitory. None so far believed the charge to be stationary.

In review of the work of Faraday, Berzelius and others, the writer can see a chain of evidence which would lead up to the electron theory. First, Faraday believed that all matter over which electricity passed became polarized. Second, Berzelius believed that every molecule was a magnet or the equivalent of one, and he went so far as to classify fifty-six of the eighty odd elements in accordance with their electrical activity. Third, J. J. Thompson believed that all elements were built up of corpuscles or electrons. Fourth, Dr. Oliver Lodge says these corpuscles constitute electricity. J. J. Thompson claims that an atom of hydrogen is composed of seven hundred negative electrons. He was unable to detect positive ones, and to determine the number of electrons composing an atom of any element he simply multiplied the atomic weight of the element by seven hundred.

Professor Rutherford claims to have found the long looked-for positive electrons, and that they are much larger than

*Read before the American Electro Medical Society, Chicago, December 1, 2, 1903.

the negative ones and also that they travel at a much less rate of speed. In almost all of the experiments endeavoring to demonstrate the electron theory, the Rhumkorff coil or a static machine, vacuum tubes and magnets were used. So far it would seem to an ordinary observer that from the following up of the early experiments and the opinions expressed of the above physicists that there are in fact two kinds of electricity, every element assumes one or the other polarity. In other words oxygen carries a negative charge and potassium a positive one, but no one assumes that it was possible for each element to carry both signs.

The writer has made both electroscopic and electro magnetic tests which suggest that possibly oxygen, while it presents on its exterior surface a negative charge, at or near its center carries a positive one, and the reverse condition in the case of potassium.

Careful experiment with the pith ball or the Faraday bag suggest that while the outer surface of both are of one polarity the inner surfaces or centers are of the opposite sign.

It seems to the writer that there is one valid reason for us to assume that electricity is the essential or fundamental unit so far as the elements are concerned, and that is the fact that their atomic weights never vary.

This is also true of the molecular weight which is the sum of the atomic weights. The reason for this, according to the writer's way of thinking, is: First, that all atoms are built up of electrical units (electrons) having both signs; second, that all atoms are influenced according to their polarity; third, that in obtaining the atomic weights, gravity, which is purely an electrical phenomenon, exerts its polar influence on the elements

being weighed, the same as one mass or magnet would influence another.

The writer is of the opinion that physicists may yet demonstrate that the negative charged electrons may, like the element oxygen, or the negatively charged pith balls, contain a positive charge, while the newly discovered positive electrons, as in the case of potassium, has also its negative sign. This recalls a belief advanced by Prout many years ago, that there is only one element in the universe, and that was hydrogen, which according to the above theory would be composed of about seven hundred of these corpuscles or electrons. That is to say an increase of the number of electrons would constitute a different kind of atom.

The discovery of radium in the opinion of some physicists has placed a different aspect on the electron theory. For instance, radium when highly active sends out light impulses resembling shooting stars.

It is the opinion of some physicists that this condition of affairs will continue uninterrupted without any apparent loss, while others say that radium will deteriorate in time. It is a well known fact that the sun throws out its force, producing ionic changes in mother earth and the surrounding atmosphere. These rays are constantly changing the position of the elementary structures in nature, so that while oxygen is stored up in the plants in day time it is given off at night, following the principle of a storage battery.

A simple storage battery consists of two sheets of lead oxide (PbO) immersed in a solution of sulfuric acid and water. After the battery has been charged the positive plate is reduced to spongy lead (Pb) while the negative plate is changed to peroxid (PbO_2). When the battery is discharged the negative plate is reduced to oxid of lead (PbO). The other atoms

of oxygen pass over to the positive plate, forming lead oxid, the same as before the battery was charged. The principle is very simple—during the process of charging the atom of oxygen is driven off from the positive plate to the negative and will remain there as long as the charging energy continues, after which it is eager to get back again. When it does the battery is discharged. This is due to difference of the electrical pull.

It is the writer's opinion that the same thing takes place in the case of radium. It is affected by the sun rays in the same manner as the oxygen in the storage battery, its activity depends upon the electrical pull. Radium loses its activity the same as the storage battery does its charge, and its quick recovery is due perhaps to the sun rays storing up more energy—the same as with the storage battery while being charged.

I think in summing up this part of the subject another feature must be taken into consideration: It is yet to be determined what part the law of harmony plays in Nature's great laboratory, its measured time, valency and color.

Making the allowance for the differences in the crude apparatuses used for experimental demonstration, I think we are justified in assuming that each electron is an electrical unit, representing both signs, and that an accumulation and arrangement of these units in relation to their signs constitute the atoms, that the atomic weight would represent in a measure the constancy of the force, and that all chemical changes are due to the difference in the electrical pull between the elements. It may be possible that the number of corpuscles or electrons hitched up in measured time gives to the atoms their existence as well as color.

The above was pointed out by the writer in an article published in the *Alkaloid*

Clinic of November, 1889, entitled "Electricity as an Antiseptic," and I am still of the opinion that these electrons form harmonic groups and that the number of octaves in the group or chain determine the nature of the element.

The human body is composed chiefly of fifteen of the eighty odd elements as follows: Carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorus, chlorin, iodine, fluorine, silicon, potassium, sodium, calcium, magnesium, iron. According to J. J. Thompson.

An atom of carbon is composed of 8,400 electrons.

An atom of hydrogen is composed of 700 electrons.

An atom of oxygen is composed of 11,200 electrons.

An atom of nitrogen is composed of 9,800 electrons.

An atom of sulfur is composed of 22,400 electrons.

An atom of phosphorus is composed of 21,700 electrons.

An atom of chlorin is composed of 24,850 electrons.

An atom of iodine is composed of 88,900 electrons.

An atom of fluorine is composed of 13,300 electrons.

An atom of silicon is composed of 19,600 electrons.

An atom of potassium is composed of 27,300 electrons.

An atom of sodium is composed of 16,000 electrons.

An atom of calcium is composed of 28,000 electrons.

An atom of magnesium is composed of 16,800 electrons.

An atom of iron is composed of 36,200 electrons.

The most important salts of the body are as follows (each molecule containing a definite number of electrons):

1. Sodium chlorid, composed of 40,950 electrons.
2. Potassium chlorid, composed of 52,150 electrons.
3. Sodium carbonate, composed of 74,200 electrons.
4. Sodium bicarbonate, composed of 58,800 electrons.
5. Potassium phosphate, composed of 148,400 electrons.
6. Neutral calcium carbonate, composed of 70,000 electrons.
7. Acid calcium, composed of 113,400 electrons.
8. Neutral calcium phosphate, composed of 239,000 electrons.
9. Acid calcium phosphate, composed of 95,200 electrons.
10. Magnesium carbonate, composed of 58,800 electrons.
11. Magnesium phosphate, composed of 183,900 electrons.
12. Potassium carbonate, composed of 96,600 electrons.
13. Sodium phosphate, composed of 114,800 electrons.
14. Potassium sulfate, composed of 21,800 electrons.
15. Magnesium sulfate, composed of 106,400 electrons.
16. Calcium fluorid, composed of 145,000 electrons.
17. Carbohydrates, composed of 126,000 electrons.
18. Fats, composed of 159,600 electrons.
19. Proteids, composed of 11,959,500 electrons.*

When a direct current is applied to the body, before electrolysis or dissociation takes place, millions of electrons or electrical units are set in motion, endeavoring to disentangle the electrons comprising the individual atoms from each group of atoms. When this is accomplished the freed ions pass in the direction of the path of least resistance. If it is the anions they pass on the direction of the lines of force or down stream, if the kations they pass in the opposite direction or up stream. These freed ions are influenced according to their polarity and pass in the direction of the path of least resistance. According to the writer's conception these electrons are electrical units having a plus and minus sign, and hitched up in closed chains and are keyed to a definite note, that note giving to the atom its color.

Before electrolysis can ensue it will be necessary to change the rythm of oscillation of the individual chains of electrons comprising the atoms, thereby freeing the ions, which pass in the direction of the least resistance or strongest electrical pull.

All changes in the tissue when electricity is applied are normally physiological; certain atoms or group of atoms comprising the tissue are influenced much more readily with a definite potential and rate of oscillation, while others are not apparently affected, and vice versa.

In electro therapy if you want to work miracles study your apparatus for varying the potentiality and oscillation of the various currents.

The Medico-Legal Value of the Roentgen Rays.

BY MIHRAN K. KASSABIAN,
PHILADELPHIA, PA.

That the skiagram, in forensic medicine, has distinct uses and value is a fact that has for some time been known both to the medical and legal professions. As time glides onward we shall observe that the skiagram, "the exact picture of the true state of affairs," will replace in the majority of accident cases the ordinary witnesses; the court and jury arriving at a decision either for plaintiff or defendant in less than half the time previously required.

During the past several years I have been privileged to produce skiagrams both for lawyers and physicians, and in quite a number of instances I have in connection with them given expert testimony. Especially is this true of the skiagram and confirmatory testimony in connection with railroad damage suits. As a result of this I feel that my experience has been more than sufficient to enable me to deliver a few remarks in this special line of work concerning the uses and value of the Röntgen rays in forensic medicine. Space and time will, unfortunately, not permit me to detail the interesting and puzzling cases for which I made skiagrams and delivered expert testimony, but what I can do will be to review a few facts and give several hints gleaned from experience, which may be of value in connection with this method of diagnosis.

That is is now considered advantageous to admit skiagraphic evidence into court is shown by the fact that the judges of advancing courts have permitted and even encouraged their use in addition to witness testimony in damage suits and even in other cases. This is true of all the courts in the eastern and middle states, with one or two exceptions. Judges, at-

torneys and jurists today do not care to have cases "hang on," but are very anxious to have all evidence handed in as soon as possible and the cases cleared up in as short a time as may be convenient. Photographs of accidents, convicts, etc., microscopic evidence, and many other scientific helps, are admitted into the various courts; why should the skiagram be excluded? Is there any reason for such rulings as were formerly made? Most decidedly not. There is not one fact offered today that is opposed to the uses of the skiagram in connection with court work—with, however, one condition, that it be produced by a person who is an expert in this line of work and not a novice.

The correctly produced skiagram is reliable, and when so produced can only illustrate the true state of affairs. It is, however, to be remembered that in order that a picture may be considered reliable, it must have been produced by a person who has had sufficient experience and as a result is skilled in the art of skiagraphy. The question as to who shall consider a skiagram as reliable evidence can in court only be decided by a person who is an expert in this particular work. A short time ago I was called as expert witness in a damage case against a railroad company and the question of a skiagram's reliability can best be illustrated by stating the facts of the case in question. Mr. H—— met with an accident and as a result brot suit against the railroad company, the plaintiff claiming heavy damages as a result of long-continued suffering and annoyance. The defendant company requested me to make a "picture" (skiagram) of the plaintiff's case, which the latter refused to permit, whereupon

the former would have made settlement. The plaintiff, however, had a skiagram made and was under the impression that he was in perfect readiness to battle with the defendant's x-ray expert. The case arrived at court and the facts laid before the jury and the judge by both sides. The plaintiff's skiagram was admitted as evidence by the judge into the court, and upon careful examination by me I decided that the photograph was unreliable in all respects. In the first place it had been made by a person who was not a physician (his occupation being salesman of x-ray instruments), at the same time the party in question had no experience in x-ray work (he having made only about a dozen attempts at skiagraphing various parts of the human body), a fact which he early admitted while on the witness stand. These facts alone would have rendered the photograph unreliable, but what is perhaps of more importance, dark lines were pointed out by the plaintiff's surgeon as "fracture lines"—at this time being "lines of callus," as he claimed. The "experts" in question had never seen four spine cases, which I made them admit when my time on the witness stand had come. What he claimed to be a shadow of callus I proved to the judge, attorneys and jury-men to be nothing more than the shadow of a spinous process—in fact the picture on very close examination showed five or six such supposed "fracture lines" which were nothing more than the shadows cast by the spinous processes of the respective vertebrae. This thus illustrates the fact that a skiagram may be unreliable, and should never be permitted to be entered as testimony until passed upon by a person whose expert competence is generally known.

From the foregoing points it may be observed that a skiagram in medico-legal cases is practically of no authoritative

value unless it has been produced by an expert. Again, it is very largely useless unless its value and exactitude are explained by either a surgeon or physician to the court. Its correctness can only be certified to by a person who is no other than an x-ray expert. The better way is for the expert who produced the skiagram to do the expert testifying, and never should an expert witness testify to a skiagram that has been made by an electrician or other non-medical man.

The value of a skiagram in medico-legal cases may be subdivided into the following headings: (1) The relation of a skiagram to the physician in making his diagnosis is of the utmost importance. A correct skiagram gives a proper diagnosis so that the attending physician or surgeon can treat said case or cases intelligently from the very beginning; the progress of reparation or cure can also be closely watched as time advances, so that the professional man can save himself from malpractice suits. I earnestly urge every physician to early have a skiagram taken of an accident, or other case, i. e. before any treatment has been resorted to, and a second skiagram after treatment has been instituted. Such records will protect the attending physician against any attempts at suits for damages in or out of court.

(2) The value of a properly taken skiagram to the judge, attorneys and jury-men is indeed so great as to leave the proceedings of an accident damage suit in darkness when no such evidence can be submitted. The time of such suit is greatly lengthened without such and, besides the expenses of the court are increased as such a suit "hangs on," a state of affairs that can be diminished when the time of trial is shortened as much as possible. When discussing the nature of an accident case, of necessity terms must be used which are of no mean-

ing to the usual run of jurymen, and in some cases to judges and attorneys. So when something tangible, as a skiagram, for instance, is submitted the jurymen, etc., will more readily understand and in the majority of cases the time of trial will be materially shortened.

The Röntgen rays show all kinds of fractures, no matter where located, with one or two exceptions, they being the base of the skull and fractures of certain portions of the vertebrae. The presence of a fracture can most decidedly be revealed in all other parts of the human body. Today we can show the exact structure of the bones, ligaments and tendons by means of the x-rays, and when fractures are present and are not reported by the skiagrapher, incompetence can be proclaimed.

Callus formation is in the majority of instances visible in the healing of a fracture, especially so when a proper technique is employed. The time necessary for the formation of callus depends upon the seat of the fracture, upon the age of the patient, upon his health, mode of treatment, etc. At any rate the repair of a fracture can be watched by the frequent production of skiagrams of the injured seat. An old fracture can be determined by the presence of callus, also a skiagram will reveal the fact whether or no the union is firm or false—whether the fracture has been united or not. By this means an epiphyseal separation may also be differentiated from an ordinary fracture, the former being more serious than the latter, thus affording more room for legal entanglements.

Dislocations can only be absolutely correctly diagnosed in early stages by means of the x-rays, the difficulty so experienced being due to excessive swelling, pain when examining by ordinary means, etc. When complicated by fracture a skiagram will be the only means of an absolutely correct

diagnosis. Reduction of dislocation as also of fracture can only be confirmed by this means of examination.

Foreign Bodies—These often remain undiagnosed, subsequently causing serious involvements. Thus when ascertained by this means dangerous probing has been avoided and the liability to infection has become nil.

Diseases of Bones are only diagnosed with absolute certainty by means of the x-rays.

Diseases of Heart and Lungs.—Certain diseases of these organs can only be diagnosed absolutely by means of the x-rays. Thus in a case of enlarged glands which gave rise to aphonia it was proved that there was no destruction of the true vocal cord, as the opposing side in a legal controversy had claimed.

Deformities.—The majority of legal cases belong to this class. The skiagram of fluoroscope reveals the actual degree of deformity of the osseous structures. If careful technic is employed there will be no resulting distortion or exaggeration of the true state of affairs. The question is often asked, "Could deformity have been avoided?" The answer to this may be as follows: The deformity is perhaps due to the fact that the physician did not know how to diagnose, and as a result properly treat, the case, and the deformity may have been due to the patient disobeying orders given by the surgeon or physician. Deformities in some instances will result no matter what care the physician and patient may take; in such cases it is always advisable to so inform the patient as early as possible. The attending physician, if afterward the latest, up-to-date, improved treatment has been employed, may be found by court to not be liable.

Functional Disability.—This does not bear a definite relation with the degree of

deformity, as in certain cases there is great deformity with little or no functional disability and vice versa. The important feature to be considered is whether or no the disability is temporary or permanent; if ankylosed is it true or false? The x-rays here again are the only means whereby an absolutely correct diagnosis can be made and an answer offered to the above.

POINTS ON THE TECHNIQUE OF MEDICO-LEGAL SKIAGRAPHY.

The technique in these cases does not vary greatly from that in any x-ray examination, except that especial care should be taken to have good, clear negatives. It is most important to have a detailed report of the case, as to the time after the accident, course of treatment, and physical signs of the accident. Examine carefully first with the closed fluoroscope, in a darkened room, so that the patient himself, or his attendants, may not see the result of the examination. Place the plate in position, in the presence of witnesses, and have a distinguishing mark upon it, such as a key or ring, for purpose of identification. Keep record of such details as the *time* of exposure, distance of the Crookes tube, position of the tube and part, etc. Take negatives from different points of view, and if possible take the injured and normal parts upon the same plate, for the purpose of comparison.

INTERPRETATION.

Now study the negative, provided it is satisfactory as to technique. Compare with previous negatives you have taken of the same part of the body and also with the corresponding normal part of the same person, being careful, however, to ascertain whether the supposed normal part has ever been the seat of a fracture. Print several copies, light and dark, so you can choose the print that shows the

condition the clearer. Write on the negative the names of the bones and try to make the picture intelligible to any one who examines it. Also make a tracing on the card, which will facilitate a proper understanding of the picture to untrained eyes. Having now made a positive diagnosis, write your expert diagnosis in a clear manner. An x-ray diagnosis will carry more weight in court if made by a physician, than if made by a man who is merely a photographer or a manufacturer of x-ray apparatus.

When called to court as an expert witness in a medico-legal case, it is important for the x-ray diagnostician to prepare himself carefully on the anatomy and pathology of the parts, to take with him negatives and prints of his x-ray examination, together with a set of bones of the part under consideration. When on the witness stand, he should be careful and accurate as to his statements, remembering the opposing party may also have an expert witness who would be likely to dispute his statements.

I can not do better in conclusion than quote the sensible, manly advice given by Sir William Blizard, of London. He says, "Be the plainest of men in the world in a court of justice. Never harbor a thought that if you do not appear positive you must appear little and mean. Give your evidence in as concise, plain and yet clear a manner as possible. Be intelligent, candid and just, but never aim at appearing unnecessarily scientific. State all the sources from and by which you have gained your information. If you can, make your evidence a self-evident truth. Thus, tho the court may at the time have a mean opinion of your judgment, they must deem you an honest man. Never be dogmatic or set yourself up for judge or jury. Take no side whatever but be impartial and you will be honest."

In conclusion again, I desire to say that I am of the belief that this distinguished body realizes the importance of x-rays in forensic medicine, having already been of great aid in diagnosing and deciding complicated legal cases appearing before the courts.

By hearty co-operation of both the legal and medical men in the future, the x-ray diagnoses will furnish the most scientific and unerring evidence in obscure cases.

A Novel System of Wireless Telegraphy.

Last year some beautiful experiments in wireless telephony were made by Herr E. Ruhmer on the Wannsee Lake, near Berlin, which were continued with increasing success in the course of the summer. Now the inventor has applied his process to optical telegraphy, and the Siemens & Schuckert Works are just now bringing out these novel wireless telegraph apparatus.

In optical telegraphy the rays issuing from a projector are, as a rule, intercepted at given intervals so as to form luminous flashes, succeeding one another more or less rapidly. In the Ruhmer telegraph system, on the contrary, the so-called speaking arcs are utilized by superposing on the continuous current circuit of the lamp placed at the sending station in the focus of a projector, a continuous current rapidly broken by means of a mechanical interrupter, the opening and closing being performed by a Morse key in accordance with ordinary Morse signals. At each closing of the telegraph key the superposed and frequently interrupted continuous current will modify the luminous intensity emanating from the electric arc, giving rise to luminous oscillations which are projected toward the receiving station. If all the conditions be so arranged that the luminous intensity of the lamp is

maintained constant, this process will ensure not only a more rapid handling of telegrams, but will permit, at the same time, of keeping the latter strictly secret, as the human eye, incapable of discerning more than ten luminous alternations per second, will get the impression of a continuous beam, on account of the rapidity with which the luminous oscillations of the transmitting station will succeed each other.

The receiving station is arranged in a way analogous to those of optical telephony, comprising two telephones and one parabolic reflector, in the focus of which the selenium cell is placed. The luminous oscillations of the transmitting station are perceived in the telephone of the receiving station by means of the selenium cell as humming intermittent sounds, constituting acoustical and directly perceived Morse signals. The pitch of the sound will depend on the frequency of the interrupter. Whereas in transmitting speech uncertainties are possible on account of the different acoustical intensities of the different vowels, the same sounds are heard here for more or less prolonged intervals. It has, therefore, been possible to ensure perfectly clear transmissions of signals in atmospheric conditions which would have rendered difficult the transmission of speech. The beginning of a communication is indicated by a bell, operated by the selenium cell without the agency of any wire connecting it with the transmitting station.

The satisfactory results of the experiments so far made go to show that this system of optical telegraphy, like the analogous system of optical telephony, will be used to special advantage in the case of transmissions over brief distances. It will, therefore, be especially suitable for military and naval purposes.—*Electrical Review*.

Dangers to the X-Ray Operator.*

BY JOHN T. PITKIN, M. D.

BUFFALO, N. Y.

(Continued from page 11.)

The outside of such tubes becomes rapidly covered with dust and carbon, they are enveloped in a strong high-tension magnetic field which electrically charges all objects in the neighborhood; such tubes emit rays of an extreme degree of penetration. The relative danger of these tubes will change when we have stronger exciting apparatus. The latent capacity of the softer tubes has (probably) as yet never been utilized. The length of spark a given tube can back up is not mentioned, because the solidity and thickness of a spark are more essential to the efficient operation of a tube than its length—at least this has been my experience.

CHAPTER II.

For purposes of study let us divide the action of the rays of Roentgen upon the operator into four arbitrary stages.

(1) Preparatory stage, or stage of first impressions.

(2) Premonitory, or threatening stage.

(3) Stage of inflammation and disintegration.

(4) Stage of chronic skin diseases, etc.

Preparatory Stage, or stage of first impressions.—As you are all well aware, the operator receives no warning from the tube, experiences no sensations while being injured. After a time there is a little change of color of his hands and face, which he may erroneously attribute to the action of the solar rays.

"His face is like the tan."

A few papules or pustules, with itching here and there, or bran-like scales, appar-

ently a local skin trouble (prurigo, acne or pruritus), a little swelling of the hands and features from circulatory disturbance, the falling out of his hair, attributed to senility, when in reality these are caused by the Roentgen rays, which are rendering the integument more and more susceptible to their action. Such symptoms should be looked upon as harbingers of an impending storm.

During a long period of increasing susceptibility the operator may imagine himself an x-ray immune, as if by some special dispensation he, like Shadrach, Meshack and Abednego, can walk in the fiery furnace (of the x-ray field) and not be burned.

Premonitory or Threatening Stage.—

The symptoms of this stage are itching, warmth, local diaphoresis, a mild seborrhea, partial anesthesia, luxuriant or deciduous hair (in hirsute people the shedding of the hair may be the first indication of the rays' effects), cutis anserina (goose skin), very small shot-like bodies in the cuticle, a glossy appearance of the parts as if they had been varnished, edematous swelling of the subcutaneous cellular tissue, causing the hands and face to become puffy, as they do in Bright's disease, rendering the fingers and palm of the hand stiff and awkward, effacing anatomical markings, and giving a general rotundity of contour. Punctate red spots, few and scattered (discrete) or many and close together (confluent), in groups, or patches diffuse; some are raised, others on a level with the surface. They may cause the skin to become as rough as the surface of a nutmeg grater. Some of the minute elevations may be colorless, and can be best seen by looking at the parts

*Read before the American Roentgen Ray Society, University of Pa., Dec. 9, 1908.

obliquely; they can also be discerned by careful palpation; there is a flushed look to the skin about them.

Discoloration of the skin may be red, reddish blue, yellow, brown, or black. The first two colors may or may not disappear; the others always remain, on pressure. Pigmented portions of the body are especially affected by pigmentation. The same is true of very dark individuals.

It is by keeping diseased parts of the patients who have malignant ailments in this stage of irritability, edema, tanning, or redness, and partial anesthesia, that the greatest number of cures can be effected. From this stage the operator may recover, with or without desquamation. (Exclusion of all forms of actinic rays, a good sweating of the parts, and crowding all the other enunctories will help to restore the parts.) Otherwise, as the result of further exposure an operation or an accident such as a cut or blow to the irritated parts, the process will slowly and insidiously merge into the stage of chronic inflammation with its "cardinal signs, calor, dolor, ruber, tumor and functio lesae."

Stage of Inflammation and Disintegration.—The pathognomonic symptoms of x-ray inflammation, as experienced by myself after seven years' exposure in the x-ray field, were extreme itching, with constant desire to rub, scratch or dig into the affected parts. If the itching of the alleged seven years' itch could be crowded into a few months' time it would not be more aggravating. Eruptions, scarlatini-form rash, miliary papules, pustules and vesicles came in successive crops. They resulted from the more or less destructive inflammatory involvement of the follicles and their cellular elements. Like thorns in the flesh, or other foreign bodies, they were thrown off, leaving the skin honeycombed with small ulcers oozing a

hydro-serous discharge, alkaline in reaction. This discharge may be odorless or have a putrid smell, according to the severity of the process. Some of the hairs could be drawn from their pockets, as if they had been loosened by electrolysis.

Exfoliation of the skin; fifty, a hundred times, or more, the epidermis was thrown off in scales of various size, shape and consistency. In places slightly affected the desquamation was scarlatini-form, the disease painless. Where quite severe the scales were at first thick and macerated, pseudo-membranous. Late in the disease the scales became desiccated and appeared as they do in many forms of skin disease. If the scales were torn away the surface bled freely from the points of their attachment.

Inflammatory mounds; where the process is quite severe, but attacks circumscribed areas more severely than intervening spaces, inflammatory mounds appear capped with a white membranous patch. In time the patch breaks down, leaving a ragged-edged crater-like opening. A common position for these mounds is over the articular surfaces, but they may form upon the dorsum of the hand, the fingers, and in other localities.

Extensive ulceration; if the inflammatory process is severe, the eruptions, small ulcers and mounds all become confluent, the surface breaks down, forming ulcerated excavations with a raised border. Their central portion may be either naked or covered with a thick whitish pseudo-membrane. Under these conditions the suffering is intense, the discharge sanious and offensive.

Pain and Suffering.—For a description of the pain and suffering, hyperesthesia and paresthesia, no language, sacred or profane, is adequate. The sting of the honey-bee or the passage of a renal cal-

culus is painful enough but are comparative pleasures, because being paroxysmal they have a time limitation. There is extreme tenderness to the slightest touch; hot and cold waves and flashes, warmth, tingling, pricking, throbbing, stinging, crawling, boring and burning sensations, as if the parts were on fire and contained bugs and other living things, and as if the anatomical structures were being moved from one position to another. All of these sensations are proportionate to the depth of the inflammatory process.

All forms of radiant energy, light, heat, magnetism, ultra-violet rays, etc., increase the suffering. The parts are irritated by soap solutions or attempts to use them for any purpose. The suffering is also augmented if the affected members are allowed to become dependent, hence the afflicted operator holds his hands high above his head, even sleeping with them in that posture.

If the inflammation in his hands is severe, muscular action will be temporarily lost, the fingers immobile. He must be dressed, undressed, and fed by attendants.

Healing of the Parts.—There are abortive efforts of the parts to heal; they heal over only to break down again, or, healing in some places they break down in others. No healthy scabs form over the ulcers, no laudable pus, so-called, appears.

The formation of granulations and scar flesh is defective, consequently the processes of repair are indolent, ineffectual, requiring months to restore the parts.

Eventually the epithelial cells will spread from the margin and islet over the ulcerations, and the injured parts are thus supplied with a thin investment. Muscular power returns. Wherever the hair is restored, as it frequently is, it will return more vigorous.

Physiological rest, an elevated position, exclusion from all forms of actinic rays,

the burning away of deciduous material with dioxygen, the employment of formaldehyd, 10 per cent solution, as an antiseptic wash, and a thick dressing of equal parts of vaselin and powdered starch, evacuation of pustules, and the wearing of kid gloves for several months after the acuteness of the attack has passed, will afford considerable relief to the sufferer. Dr. Robinson, of Philadelphia, uses picric acid; Dr. Dunning, of the same city, employs the lead plaster.

I quote the following, illustrating an extreme degree of chronicity of x-ray inflammation, also showing how the operators who work with the most powerful apparatus and the greatest number of hours per day are usually the greatest sufferers:

"LONDON, August 6, 1903.—(Via Associated Press.)—Two doctors belonging to the London Hospital have been affected by x-rays in a manner similar to that of the assistant of Thomas A. Edison, and have been compelled to abandon their work. They were engaged for a long time in making examinations of and manipulating diseased parts while x-rays were directed on the patients.

"When they began to suffer they tried gloves, on the backs of which lead foil was sewn, but these impeded the movements of their hands and were discarded.

"One of the operators ceased operating under the rays eighteen months ago, yet his hands have improved little despite constant treatment."

To return to my own case, large red blotches and acne pustules appeared on my face and neck, with a burning sensation, followed in time by desquamation and restitution. The parts were left sensitive to light, heat, etc., which for a time caused them to redden and peel in furfuraceous scales. My left hand was much involved, hundreds of minute abscesses formed upon

the dorsum. The integument exfoliated many times. The nail of the ring finger came off, but was renewed. The nails of all the digits, except the thumb, became deformed, brittle and deficient in their usual luster. The shape of the hand was permanently changed, the rugae of the skin, the ridges on the nails, the knuckles and palmar arch are more prominent than they were formerly. Yawning caused muscular spasm of the fingers. Inflammatory mounds with their white caps and crater-like openings came and went in the usual dilatory manner.

Five months after the onset of the attack the parts had healed, but were so sensitive to the Roentgen rays that a fifteen seconds' exposure about one yard from the tube in a strong, high tension field caused a secondary dermatitis. The period of incubation, usually from one to two weeks, was reduced to as many days. The secondary dermatitis cleared up several large ugly patches of skin disease left from the primary attack. This shows that the x-light may in a measure prove to be a remedy for its own indolent process and sequela.

Eight months after the onset of the

primary attack improvement slowly but surely continued in the newly formed skin, the atrophic changes remained the same but the hypertrophic changes had diminished. The skin was more tolerant of all forms of actinic rays. The vaselin and starch dressing was still employed at night, but the wearing of gloves during the daytime was no longer necessary.

In the primary attack the right hand was less severely affected than the left. Tenderness extended up both arms into the axilla. I suffered with malaise, daily chill and fever (mild), headache, sore throat (mild), nausea and vomiting (one attack, quite severe), vertigo (mild), and one attack of dyspnea (severe but short), probably from cardiac impairment of function. There was a fine rash like that of typhoid fever scattered over the entire body.

Whether an attack of erysipelas, sustained in both hands about twelve years previous, predisposed me to x-ray inflammation, modified its course or prevented cancerous sequela, I am unable to determine; certain it is, the two diseases (x-ray dermatitis and erysipelas) have many symptoms in common.



Mild Case of X-Ray Dermatitis, showing scarlatiniform desquamation and pigmentation.
(Cut loaned by Dr. Pratt.)

Electro Therapy.

A Course of Twenty-four Lessons under the auspices of the Chicago College of X-Ray and Electro Therapeutics.

Lesson V—STATIC CURRENTS.

A static machine may be used to obtain either direct or alternating currents. The direct current is obtained from the large brass balls (prime conductors) in front of the machine. The circuit extends from one of the prime conductors by means of an insulated brass rod to the collecting points on the inside of the glass case, from which the charge is carried on the surfaces of the rotating disks to the other collecting points, and thence to the second brass ball. Between the prime conductors the circuit is completed by the sliding discharging rods when these are in contact, or partly by them and partly by the air.

The direction of the current may be inferred from the appearance of the spark between the discharging rods or at any other place at which there is an air gap in the circuit. If the two small brass balls are well polished and are a very little distance apart there is between them a violet streak of light with a distinct white streak at each end of it. At the anode or the positive pole the white streak is longer than the other, or the positive current passes from the longer to the shorter white streak.

As the rods are drawn still further apart there comes a point at which the whiteness extends clear across between the balls. The current at this stage is oscillating; that is to say, each impulse of the current is followed by rapid and rapidly diminishing alternations of the current. This current has polarity, but its direction can not be detected by the eye alone.

When the rods are drawn still further apart the character of the spark again changes. It is now a bluish white or violet zigzag line, starting out from the anode in a perfectly straight line for a

centimeter, more or less, then making angles, and at the angles giving off fainter bluish tree-like branches. Further on the line may become hazy, or may disappear, but it soon re-collects and forms a solid and much whiter streak, which continues nearly, but not quite, up to the kathode.

If the point of a stick be placed in the path of the spark and close to the anode, the current seems to prefer the stick to the air for a pathway, and will follow the stick for some distance when the point is moved across its path. At the kathode the current pays very little attention to the stick. In this way the direction of the current may be known even in the oscillating stage. The oscillating current is really the sum of a direct and an alternating current.

When a wire, a chain, or any other conductor is connected with one of the prime conductors, and another wire to the other prime conductor, these wires become part of the circuit and the spark may be obtained by bringing their extremities near together. The principle is exactly the same if a gaspipe or the ground takes the place of one of the wires. A great deal of what is said and written about "grounding" one of the poles of a static machine is nonsense.

When there is an air gap in the circuit, of such a character that sparks are visible, the static current is always intermittent. The current becomes continuous, or nearly so, when the circuit outside of the machine is entirely metallic, or when there is a gap bordered by one or more metallic points. The amperage of such a current depends upon several factors: the number and size of the revolving plates, their arrangement, their speed, the electro-motive

force the machine can maintain, leakage at various points, and, lastly, the resistance of the outer part of the circuit. Of these factors the only ones that are under the control of the operator with a given machine are the speed of the plates and the resistance of the outer circuit. Under favorable conditions a good static machine gives nearly one milliamperé of current. The current is diminished in proportion with a diminution of the speed of the machine. The current is also diminished in proportion to the resistance of the circuit. These remarks apply to the current only when it is continuous or nearly so, and are only approximately true for the spark discharges.

The relative amount of current in the sparks may be inferred from their appearance. A spark whose current is small looks thin and blue or violet, and has a strong tendency to split or branch. When the current in each spark is greater the spark is thicker and whiter and is more likely to form a single streak.

The alternating current is obtained from the static machine by means of the Leyden jar condensers. One of these is usually placed on each end of the shelf in front of the machine. The brass knob of the jar, which is in metallic connection with its inner coat of tinfoil, is connected with the nearest prime conductor. Its outer coat is usually connected to a binding post on the same shelf. To these two binding posts the wires of the electrodes are connected for treatment. This secondary circuit, in which the two Leyden jars are included, is sometimes referred to as the induced circuit. It includes the prime conductors and their discharging rods, with the air gap between them. The Leyden jars and the conductors extending between their outer surfaces complete the circuit.

The electro-motive force of the sec-

ondary circuit is produced by the changes in the potential of the prime conductors when sparks are passing across the air gap. When a spark begins, the resistance of the air gap suddenly drops to nearly zero. The potential of the prime conductors also becomes zero, but immediately rises on account of the accumulating charges due to the continued rotation of the plates. When the potential has become so great as to produce another spark it again drops, and so on. When the potential is high, say upon the positive pole, a right-handed twist extends thru the glass of the Leyden jar and into the lower part of the circuit. At the same time a left-handed twist extends thru the glass of the other Leyden jar into the lower part of the same circuit, there reinforcing the first. When the potential drops, the elasticity of the glass causes a reversed turn of these atomic chains. The first turn being considered positive, its reversal constitutes a negative current. When the alternations of the current thus induced in the secondary circuit are very rapid the current is nearly sinusoidal. When the sparks are less frequent, the electro-motive force of the prime conductors rises slowly and drops suddenly. The first induced current (positive) has, therefore, much less electro-motive force, but longer duration than the second. Under these conditions, if a spark gap of sufficient size be made in the lower part of the secondary circuit it may be so adjusted that the positive current fails to pass while the negative (reverse) current succeeds. In this case the current in the secondary circuit is direct, that is to say, in one direction only.

When the resistance in the secondary circuit is small in relation to the capacity of the condensers, the current velocity during the reversal becomes so great that the elastic atoms in the glass are turned

beyond the point of equilibrium and are twisted in the opposite direction. Their return produces a second positive current, which again may swing too far and give rise to a second negative current, etc. In such a case we have in this circuit an oscillating current resembling in char-

acter the more rapid high frequency current.

These are all the currents which it is possible to obtain from an ordinary static machine without the use of additional apparatus. Their applications will be described in the next lesson.

Two Cases of Severe X-Ray Necrosis, Presenting Some Unusual Features.

BY CLARENCE EDWARD SKINNER, M. D., LL. D., NEW HAVEN, CONN.

Read at the fourth annual convention of the American Roentgen Ray Society, at Philadelphia, Pa., December 9, 1903.

The unusual features about the first case were:

First, that the necrosis extended to a depth of three-quarters of an inch by actual measurement, and covered a surface four inches in the vertical by eight in the lateral diameter.

Second, the epithelial layer covering the contiguous apparently healthy areas peeled off two months after the last x-ray exposure, leaving soft, pink, healthy epithelium in its place. In the course of three weeks this skin had become as deeply browned as that which had peeled off, altho no exposure to the rays had been made in the meantime.

Third, the pain ceased when the necrotic tissue had completely sloughed.

Fourth, the negative pole of the galvanic current was used with satisfactory results in accelerating the process of healing.

Fifth, an area of necrosis appeared five months after the last x-ray application in a region which had previously exhibited no evidence that any injury had been inflicted.

Sixth, a dusting powder, consisting of equal parts of anesthesine and talc was

entirely effective in controlling the pain in the last mentioned area of ulceration.

The noticeable features in the second case were:

First, that subcutaneous effusions of blood appeared in about two weeks in advance of necrosis in all the tissues which were affected.

Second, profound erythema and structural modification appeared spontaneously in the newly formed skin, covering the apparently healthy areas contiguous to the necrotic localities, and which had been exposed by the exfoliation of that which had been browned by the direct agency of the rays, altho this new skin had not been exposed to the ray.

Third, the pain ceased as soon as the necrotic tissue had completely separated.

Fourth, the negative pole of the galvanic battery produced apparently no effect as far as accelerating the separation of the slough was concerned, but its beneficial influence upon the reparative process was very noticeable after the tissue had sloughed.

Fifth, an area of necrosis appeared six months after the last x-ray application in a region which had previously indicated

no evidence that such injury had taken place.

Sixth, the anesthesine and talc mixture referred to in connection with the previous case aggravated the pain when used in Case 2.

Dr. Skinner states the conclusions which draws from these cases to be as follows:

First, the belief somewhat extensively held that a patient who "tans" well need not fear a burn is demonstrated to be untenable. Both of these patients tanned readily and profoundly.

Second, the "tanning" and excessive epithelial proliferation of the new skin observed in Case 1, and the profound erythema and structural changes of the new skin observed in Case 2, all of which modifications obtained in tissues which had developed months after exposures to the rays had ceased, indicate that the physiological action of x-light is not confined to stimulant or destructive influence upon tissues that already exist, but that it is capable of modifying most profoundly and more or less permanently the developmental functions which control cell growth. It is believed that this phase of influence will be ascertained ultimately to play no small part in the beneficial effect exerted by the x-ray upon many cases of malignant growth.

Third, the abrupt cessation of the sharp, cutting pains simultaneously with the final separation of the necrotic tissue would point to direct irritation by the sloughing mass of the distal ends of nerve trunks supplying the affected parts as their exciting cause, probably thru the development of toxins by retrograde tissue metamorphosis at the line of separation; a neuralgia, in short, and which would indicate extirpation of the necrotic area by curettement or otherwise as a log-

ical management for x-ray dermatitis of this degree.

Fourth, the accelerating influence of the direct electrical current upon the process of healing after the slough had separated, noted in both cases, is significant from a therapeutical standpoint. The power of the negative pole of the direct electrical current to hasten repair in open sores of various sorts has long been known to electro-therapeutists, but the x-ray ulceration has exhibited a peculiarly intense resistance to all ordinary measures available for this purpose, and the knowledge that we have in this modality an effective curative agent even in this condition constitutes a comforting thot. It is probable that skin grafting will be avoidable in many cases where galvanism is available.

Fifth, the appearance of new areas of necrosis in Case 1, five months, and in Case 2, six months, after the last x-ray exposure had been made, admits of three hypotheses in the way of explanation. It might have been due to a cumulative characteristic of the ray, whereby the direct effect of the exposure did not fully develop until after these lapses of time; it may have been due to a modifying influence exerted by the ray upon the developmental functions of the cells involved, whereby the younger generations of cells were unable to acquire the degree of vitality necessary for the maintenance of tissue integrity; or it may have been the indirect result of circulatory insufficiency caused by an x-ray endarteritis obliterans which had required this length of time for its full development. None of these are entirely satisfactory, however, and we shall have to await the acquisition of a fuller knowledge of the *modus operandi* of x-ray effects before we can decisively account for this and many other of its vagaries.

Sixth, the sedative effect of anesthesine upon the pain in Case 1, and its aggravating influence in Case 2, illustrates the statement frequently made, and the truth of which is now pretty generally admitted, that no two cases of x-ray pain can be depended upon to react uniformly to the same palliative agents. In no other condition does there obtain so emphatic an exemplification of the old adage that "What's one man's meat is another man's poison." Each case must be treated on its own individual peculiarities, and usually the only way to ascertain the peculiarities is to begin at one end of the list of therapeutical agencies and apply them successively until we find one that is effective.

Seventh, the sudden and constant appearance of subcutaneous hemorrhage preceding the development of necrosis noted in Case 2 is worthy of record, but I do not at present comprehend its significance, nor can I offer a satisfactory explanation.

The histories of these two cases constitute a warning against exposing a patient to the x-rays with even a moderate degree of frequency thru long periods of time, no matter how well they seem to bear them at first. There are few conditions so pregnant with torture for the victim as a deep x-ray dermatitis, and the risk of precipitating such a disaster is only justifiable in cases presenting an absolutely hopeless prognosis under other methods of treatment.

Notes.

Dr. H. Preston Pratt has just returned from a trip to the Atlantic Coast. He has secured a specimen of radium of high radio activity for use in his x-ray laboratory. He has also investigated the latest forms of x-ray and electro-therapeutic apparatus, Finsen light, etc.

If any of our readers can supply one or more copies of the X-Ray Journal for December 1902, and January and February 1903, we shall be very glad to purchase them.

Electrical Typewriters.—The Blickensderfer Typewriter Company, of Newcastle-on-Tyne, is placing on the market an electrical typewriter. At the back of, and embodied in, the machine is a small motor which provides the printing power; the slightest touch of the key is sufficient to make the impression by electrical force the instant the operator's fingers complete the contact by touching the keys.



Suggestion in its Relation to Electrical Appliances.*

BY CHARLES GILBERT DAVIS, M. D., CHICAGO.

The egotism of the age in which we live is monstrous. In our youth we read from the pages of holy writ: "The wisdom of this world is foolishness." It seems to me, in taking a panoramic view of human knowledge as presented to us today, it would have been far better had this truth been more deeply impressed upon our understanding.

For how little we know! Simply babes gathering pebbles on the shore, laughing at the waves making ripples in the sand, but of the great ocean that lies beyond knowing nothing.

For thousands of years philosophers have attempted to solve the mystery of life, but the great secret remains concealed. And now in the dawn of the twentieth century, after sifting the accumulated tot of all the generations that have passed, psychologists, biologists and eminent scientists tell us there are but two things in existence, i. e., force and consciousness.

Thru the process of growth which we term evolution, consciousness has pushed itself upward and outward, gradually enlarging its recognition of the physical universe, and thru desire and auto-suggestion developed certain organs of special sense, i. e., hearing, seeing, smelling, tasting and feeling; and perhaps others are to be added later.

The highest expression of consciousness we find on our own planet is man. Reasoning from analogy I should say that man in his present condition is by no means the highest expression of conscious life. In all probability he is only an illustration of an epoch which may be followed by innumerable stages of develop-

ment continuing thru millions of years, till ultimately the conscious ego shall stand radiant with perfection, and all knowledge be intuitive. But in wisdom he is still a child.

Thru these five windows—hearing, seeing, smelling, tasting and feeling—the conscious ego looks out upon the surrounding universe. They are all that connect him consciously with physical life. Thru these windows he receives communications, and this is suggestion. Then in the crucible of his own consciousness he meditates upon the impressions received, exercises the will and expresses desire, and this is auto-suggestion.

Thru these two channels, suggestion and auto-suggestion, man has groped his way upward from the elemental protoplasm, the "unicellular organism" and the more complex forms of animal existence. Step by step it has conducted him thru savagery, the cave life of the past, the awful darkness of superstition and ignorance, and led him gently and surely into the radiant light of conscious power that crowns him in the present age.

The same law that guided the first primordial cell is still in operation. The horizon of consciousness is ever widening and deepening in its scope of power, and mind is assuming its rightful mastery over matter.

Man is still receiving messages thru these five windows of the soul, and in the crucible of his inner consciousness elaborating ideals which he projects before his vision to guide him to greater heights.

In animal life, and exemplified in its highest degree in man, we find the mind manifesting itself on two planes: First, the conscious mind, whose organ is the

* Read at the first annual meeting of the American Electro-Medical Society, at Chicago, Dec. 2-3, 1908.

cerebrospinal nervous system. Second, the sub-conscious mind which operates thru the sympathetic nervous system.

The first or conscious mind receives the impressions from the surrounding universe, thru these five windows of communication deliberates, is mathematical, logical, reasons, arrives at conclusions and telegraphs the result thru the connecting nerves to the ganglia of the sympathetic, and there impresses the sub-conscious life; and consequently reacts beneficially or otherwise on the various organs.

The second, or sub-conscious mind, presides over nutrition, receives the communications from the laboratory of consciousness, never reasons, but acts automatically thru emotion, feeling, desire and impulse. It is, in fact, the location of the real man. In this center is to be found the measure of viability. I have often remarked that had I the opportunity to manufacture a man's stomach I would not care who made his brain—he would still be a man.

The most interesting point relating to these two centers is that the subconscious mind is always open to suggestion from the conscious. I regard this subject as one of the greatest importance that can possibly occupy the mind of the medical profession today. I believe it was St. Paul who said: "As a man thinketh, so is he." This contains the germ of much truth. The influence of the sub-conscious mind over the nutrition of the system has for ages attracted the attention of thinking men, but never has it been under such widespread discussion as within the last few years.

Turn in what ever direction we may, we find illustrations. We note the effect of nutrition in the victory and defeat of armies, the rise and fall of political parties, the teachings of religion, the wild utterances of fanatical leaders, and nowhere

is it more vividly portrayed than in the healing art.

In reference to this question said that great American teacher, Austin Flint, more than forty years ago: "Gentlemen, there is something in the practice of medicine far beyond the mere administration of drugs."

Every modern successful physician knows the necessity of arousing the subtle forces of the sub-conscious mind. I would not hesitate today to proclaim before any medical convention in the world that I believe that faith, hope, expectancy and belief in many instances are the most useful and the most powerful therapeutic agents of the age in which we live.

I am a scientist and advocate the thoro pursuit of all knowledge that may be beneficial to mankind, no matter from whence it comes—whether from the beds of slime and ooze in the depths of the sea, or a ray of light vibrating thru the blue ether from the farthest fixed star. I am also convinced that often in the attempt to follow the mysterious vaporings of some scientific theory we lose sight of truth. They are not a few, but the world today has millions of illustrations of the truth of that utterance: "Thy faith hath made thee whole."

We as doctors too frequently deny this. While the patients were under our care we were willing to say they were quite ill and accept our fees for valuable services, but when they pronounced themselves fully restored to health by other means, we were inclined to doubt the presence of disease.

As true scientists we must admit, with all evidence of the ages before us, that this subjective mind is most potent both to create and remove disease. If we only observe, there is scarcely an hour of the day but we are enabled to behold the verification of this truth.

Sometime ago I saw a man rosy with health and strength, full of the joy of life, and laughter in his eyes, sitting at dinner with his friends. He was at the zenith of manhood, and the life currents flowed thru his being like a stream of pure water thru a sunlit meadow. The emotions from his spirit made glad the festal board. Suddenly a messenger entered and handed him a telegram: "Your home was swept away by the flood, and your wife and children drowned."

Like a stroke from a bolt of lightning, the effect was instantaneous. The eyes read again and again the fatal words, the message was conveyed along the optic tracts to the seat of consciousness and from there to the center of life in the subconscious mind, and the machinery of nature stood still. Every cell of the entire organism vibrated under the awful blow. All over the surface of the body the little arterioles shriveled and contracted, producing a deathly pallor, and the red globules of blood that had before been hurrying on their mission of health, were crowded back and locked up in the deep reservoirs of the system. The arms fell powerless, the muscles relaxed, hard lines were formed around the mouth, the cheeks were sunken, the eyeballs from lack of secretion were glazed, respiration was irregular and the heart almost ceased to beat. He was ill.

About twenty-four hours later I was summoned with the request to hurry. I found him dangerously ill. He was partially delirious, the face I had seen the day before glorified with health was shrunken, the eyes jaundiced, showing that the bile was being re-absorbed into the circulation, the lips were dry and breath fetid. He had vomited several times, throwing off from the stomach the food that had been abandoned by the gastric juice. This state of the mouth and the intestinal canal showed clearly that pathological

bacteria were now at work seeking the man's life.

Now supposing a consultation of doctors, without being acquainted with the incidents of the last twenty-four hours could have been called to decide as to this man's condition and the remedy, what would have been the verdict?

In St. Louis it would have been malaria, and large doses of quinin; in New York, gastro-enteritis, complicated with choledochitis and renal insufficiency, with large doses of calomel; in Chicago, immediate appendectomy.

The cause of the man's illness would have been attributed to taking cold, overwork, ptomain poisoning, champagne, or eating grape seeds. The truth of the matter is he was made ill by his mind. A thot was killing him. A suggestion had entered by one of the windows and was working destruction, threatening life.

This continued for twenty-four hours longer, and then another telegram arrived:

"Your house not destroyed—your wife and children all safe and well."

It was read to him, and slowly thru the auditory nerve the glad tidings were transmitted to the brain and from there to the subconscious centers. The arteries relaxed, the blood freighted with red corpuscles flowed thru the capillaries, and the deadly pallor was replaced by the returning hue of health. The eye brightened, the muscles renewed their vigor, and the man stood erect with glowing face.

That night he again sat at the banquet board surrounded by his family and friends, and entertained them with his overflow of vital force.

This man was made ill by a depressing thot, and he was near unto death; this man was cured by a hopeful thot. Will any one doubt the wonderful power mind wields over the body? Every thot we

think, every hope we breathe, every faith that sweeps thru the chambers of the mind, has its mathematical effect on every cell in the human organism.

An old lady came to me from Indiana. She had malaria. I gave her quinin and ferroconid of iron, in capsules. Of course the capsules were of a very blue color. In one week she returned. As soon as she entered my consultation room I saw that she had fight in her eyes, and she opened up on me the artillery of her wrath:

"Beggorrh dochter, what fur did ye iver give me that horrid blue mass? It is silivated to dith I am, I am shure!"

She showed me her mouth, and sure enough, so far as local evidence could prove, she had a case of well marked pyalism. Some years before she had been given blue-mass by a physician, and suffered for several weeks from severe salivation. She only took one of my capsules, and then, discovering that they were blue, jumped to the conclusion that, of course, they were blue-mass. Suggestion did the rest. She was sure she had swallowed a big dose of blue-mass—she expected salivation to follow, and it did.

It took all the genius of my forensic power to convince the old lady of her mistake, and I am not yet sure that I was successful, for she never returned.

Once while out of the city a lady patient of mine of neurotic temperament was taken ill. When I returned she sent for me. Her most marked symptom was insomnia. According to the statement of the nurse, she had not slept for three days and nights. Her table was covered with bottles of bromid, chloral and other hypnotic potions, to none of which had she yielded to receive a moment's sleep. Her tongue was coated and the skin sallow. Evidently the action of the liver was disturbed. I knew her temperament, and recognized the necessity of some form

of suggestion to remove the apparently fixed idea of her inability to sleep. At the same time I also felt that she required something to restore the action of the liver and arouse the intestinal canal to increased excretion.

I resolved to combine the two lines of treatment, and ordered for her one grain of calomel combined with three grains of bicarbonate of soda, saying impressively:

"You are undoubtedly very ill, and the urgency of the case requires something very powerful to meet the conditions. I have given you one small white powder which I am sure will do the work. As soon as this comes from the druggist take it on the tongue dry, followed by one tablespoonful of cold water. Then turn on your right side—be sure it is the right—count one hundred, and you will sleep soundly."

When I called the next day she met me with a smiling face. She had awakened from eight hours' slumber, and the bowels had moved, restoring completely the function of the abdominal viscera. This happened several years ago, but many times since then this patient has begged me the name of the wonderful little white powder that made her sleep, but I have always refused the request, intimating that it was too dangerous to be trusted for administration by other than skilled professional hands. In this case there are two ways of looking at the cause of the results obtained.

First—That it was all purely suggestion, and that the medicine had nothing to do with her cure.

Second—That the calomel and soda were just what she required to start the liver and other viscera into action, and the vis-a-tergo from this action restored the cerebral circulation, and sleep naturally followed.

In my own mind I am satisfied that

the prescription was rational, but I am also thoroly convinced that suggestion played the major part in her restoration. It will be observed in this case that all of my suggestions were made along the lines of scientific truth.

First—these two remedies were just what she required to unlock the viscera.

Second—I said the medicine was powerful, and so it is, in its manner of action.

Third—I told her to be sure and turn on her right side, for in this position the powder would the sooner pass from the stomach and hasten the flow of bile thru the intestinal canal.

Fourth—In directing her to count one hundred I established a rythm of concentrated thot that would be conducive to sleep.

So the *tout ensemble* was scientific, suggestive, powerful and successful.

Electricity usually flows best when it follows a good conductor, and so does suggestion. In this case the powder was the conductor that conveyed the suggestive impulse to the patient. I believe always that suggestion should be made along the lines of known scientific truth. In this way they are more potent. No man can long propagate a lie, and succeed. I do not believe in placeboes per se, they must always have *vera causa* relating to physical effects. In this way the physician believes himself in what he is doing, and can with confidence and power send the suggestive impulse to do its work. A liar shows the falsehood in his face, while truth is bold and convincing. Thrice assured is he who is armed with truth!

Certainly there is much more in the practice of medicin than can be attributed to the action of drugs. Look at the *materia medica* of the world, and trace its history back for one or two thousand years. What a constant revolution of ideas! What wonderful panaceas have

arisen and then gone down in oblivion and been discarded as useless.

And yet somehow poor struggling humanity has managed to survive, and among all the nations, savage as well as civilized in about equal proportion, they have lived and died of old age. The yellow hordes of China's millions, the countless hosts of India, and the swarms of humanity on the deserts of Egypt, for thousands of years have manifested plethoric fecundity, multiplied, lived and manifested all the normal functions of life, ages before a single article of our *materia medica* was discovered, or such a thing as a bacillus or counteracting antiseptic entered into the wildest visions of the Orient.

We are growing too introspective, and introspection is bad, because it creates disease. We are arg'ing too much along the line of *post hoc ergo propter hoc*. Let us not pride ourselves on our knowledge, for I have not the slightest doubt but that in a hundred years from today our successors will stand upon this very spot and scream with laughter over our methods of combating disease.

Running continuously thru the healing art is the potent current of suggestion. It is everywhere. The mother's kiss and her soothing tones carry a suggestive calm to the subconscious life of the suffering infant, and it is soothed to rest.

The intelligent citizen enters the office of the prominent physician. His blood is examined under the microscope, his urine analysed, his stomach pumped out, and finally he is thumped in the ribs and given a prescription. He is fully convinced that he has met the quintessence of human wisdom, goes home and swallows his dope of bromid or strychnia, and feels the thrill of health capering up and down his spinal column. Tho he would deny it vehemently, the mysterious wand of suggestion has touched and thrilled the centers of

organic life. One of dozens of the different articles of our *materia medica* might have been administered to him, and equivalent results obtained.

It is wonderful with how few remedies we can practice medicine. We had a physician in Chicago whose prescriptions for more than twenty years were composed largely of carbolic acid, blue mass, jimson weed, and baking soda. And yet it is not unusual now for a good old Irish mother to entertain me by relating some severe illness of her younger days of which she was healed by one of these potent mixtures.

Faith, like electricity, must have a conductor. There must be a medium to touch one of the five senses. The eye must see, the ear hear, or the tongue taste, to awaken the suggestive power.

Humanity has not yet risen to the sublime altitude of development to enable it to evolve perfect faith from the inner consciousness.

Religion still requires the graven image, the lighted tapers and the chanting choir; and the patient rests his wavering hope on the powder and the pill.

We read in Holy Writ that Christ cured the blind man by making an ointment of spittle and clay and applying it to the eyes. Many undoubtedly discredit this miracle, but to me it seems most rational. What was required in the case was sufficient faith in the Great Physician. Adherents to the higher criticism, while admitting the miracle, would probably say that the man had only some inflammatory condition, and the clay with its silicious composition was just the medicine required to make a soothing ointment which would do the work. And then the saliva of course, it is bactericidal, and here we have a mixture which would satisfy the logical reasoning of the most advanced modern theologian. But to me the operation of faith, arousing the nutritive

forces of subconscious life, seems by far the better explanation. The man had feeble faith, and the ointment gave it support.

Without argument as to the actual occurrence of this miracle, we must admit it to be a splendid illustration of the *modus operandi* of suggestion.

But what has all of this to do with electrotherapeutics? Very much, indeed!

Whatever is new and mysterious and wonderful to man is God-like and in the imagination endowed with superhuman attributes. All therapeutic agents are capable of a two-fold action. First, we have what we may term the normal, direct or physical result of the active agent, whether it be a drug, electricity or the surgeon's knife.

Second, we have the psychic effect, whereby the normal action of the remedial agent, whether electricity, a medicine or a surgical operation, is perverted, altered, depressed or wonderfully exalted; dependent upon numberless conditions, as by whom or to whom directed, and in what environment.

This latter, the psychic, I regard of great importance and far-reaching possibilities, and should always be taken into account by the intelligent physician. The evanescent wave of this always follows the announcement of new discoveries in medicine and surgery, and the legitimacy of the healing art passes often then to the realms of quackery.

Looking backward over the history of medicine we smile at the announced efficacy of dragon's blood and dried toads, and again we blush that within our own memory, the profession and the public aroused such enthusiasm over phlebotomy, phenic acid injections, Candurango and Koch's lymph, to say nothing of the abuse of appendectomy.

Of all therapeutic applications that are today employed in our profession, I know

of none in which we are more liable in judging of results to mistake sequences for consequences, than that of electricity. The greatest scientists of the age know but little about electricity. Our profession does not know a great deal, and the public still less.

It is natural, shrouded as it is in mystery, that in the mind its effects should be exalted. I well remember my first experience with electricity. It was about thirty years ago, and I purchased a Kidder's battery.

It seems to me when I look back at those days that I then obtained almost if not quite as wonderful effects as now when equipped with the complicated paraphernalia of electric appliances.

Then I scarcely knew one current from another, only that one was silent, and the other made a noise. I usually chose the noisy current, because it seemed to impress the patient that something was doing and he was getting the worth of his money.

It was not considered very ethical to use electricity in those days, consequently my conscience goaded me, and I kept the battery under the bed, so that my confreers could not discover it when they called.

But they finally found me out, and I was considered quite irregular, particularly so as my cases increased. The cures that I made were indeed wonderful, covering a wide range of cases from malaria to fits. But I finally drew the line when an old farmer who had heard of my wonderful machine drove up and wanted me to try it on his horse to cure the bots.

When I look back upon that period now I fully recognize the suggestive effect of the electrical application on a people who were entirely ignorant of electricity and mystified by its manifestations.

But are we not doing very much of the same thing today only in a more advanced stage? The knowledge of the public is greater and superstition may have somewhat abated, but to counterbalance this our paraphernalia are still more wonder-creating.

Time and again I have known a patient to rise from an electrical application, when the battery had become suddenly out of order and there was no current at all, stating that he felt a wonderful improvement from the treatment.

I have seen warts and other growths removed by the x-ray. So have I many times seen the same thing done by a village conjurer. So I repeat again, there is no therapeutic agent in present use so liable to act in a suggestive way.

The ponderous machinery in the electrician's office, the thot of chain lightning, the sharp flash of the spark, the wonderful violet spray from the static machine and the marvelous x-ray, all have a tendency to excite faith, hope and expectancy. But suggestion is legitimate, it is justifiable; only as scientists let us not be confused.

I want to be distinctly understood as an advocate of advancement along all lines of scientific investigation. I thoroly believe in all branches of the healing art directed to the physical organism. I believe in internal medicine, surgery and electro-therapeutics.

I am proud of the progress we have made in our knowledge of electricity, and feel confident that we are still in the suburbs of this subject, and that splendid revelations will ultimately reward our labor in the future. All honor to such names as d'Arsonval, Apostoli, Daumer and Audin!

They have blazed the way, and it remains for us to take up the line of thot and study of this mysterious force that

seems to concern all matter, from the growth of the single cell to the ponderous evolution of planets thru the realms of space.

But gentlemen, while we grasp every source of knowledge relating to remedial

agents that act on the physical organism for the removal of disease, let us not forget that there is a psychic side to this question. Let us be thoughtful, let us be scientific, let us be honest. We must recognize the great law of suggestion.

News and Notes.

The Telephone as a News Vendor.

The distribution of the principal news items of the day by telephone instead of in the form of a printed newspaper has often been predicted, and is now actually an accomplished fact, tho on a limited scale only. Mr. M. W. Pershing, postmaster and editor of the *Tipton Times*, Tipton, Ind., controls a number of farmers' telephone circuits, which radiate in all directions from his office and, in many cases, extend for a considerable distance into the surrounding country. Mr. Pershing receives the Indianapolis papers about six p. m., and, after abstracting and summarizing the principal contents likely to prove of interest to his subscribers, he calls the latter up by 'phone, giving a simultaneous prearranged signal, which brings each farmer, anxious to learn the news of the day, to his instrument. Mr. Pershing then proceeds to retail to them the various news items which he has abstracted from the papers, including weather reports and market fluctuations. The verbal news system thus inaugurated is said to have become very popular among the surrounding farmers who have no other means of keeping in immediate touch with the rest of the community, and Mr. Pershing will probably have imitators.—*Electricity*.

Hydrotherapy in Insanity—Only recently the superintendent of one of our large asylums in writing to me said: "I have come to have very much reliance

upon hydiatic measures properly applied in the treatment of these cases, and I think the simpler forms can be readily applied in almost any household. One of the most effectual methods to quiet excitement, secure sleep, and promote elimination is the wet-sheet pack. Were I called to a private house this morning to see a case the type of which is familiar to us, with wakefulness, agitation, psychomotor restlessness, and the train of symptoms that accompany acute maniacal excitement or agitated melancholia, I should, if it were possible, first give the patient a large simple enema of water at 100° F. I would then thoroly wash out his stomach with sterilized water at about 107° F., then wrap him up in a large wet sheet saturated in water at about 112° F., and then thoroly roll him up in blankets, using two or three or more if necessary. A little experience will enable one to so envelop the patient in the wet sheet and blankets that however restless and uneasy he is, it forms one of the very best methods of restraint. We very often find that a patient in a wet-sheet pack soon quiets down and presently drops asleep, sometimes sleeping the night in the pack. In any event he often gets from one to two or three hours of refreshing sleep. When the pack is removed he can have an alcohol rub or a little light massage, which any intelligent person can give with a little instruction. There are dangers of collapse, but the signals of such danger

are so plain that the doctor will recognize them very readily, and his patient may be removed from the pack and such methods of stimulation resorted to as may seem to be required. When in the pack, ice to the head and hot-water bottles to the feet are important. This wet-sheet pack may be repeated when the patient again becomes restless or disturbed. The quantity of water which he drinks while in the pack promotes elimination, and this method is altogether so much more rational and simple than the heavy dosage by drugs that I think it important that it should be brought to the attention of every physician who is likely to have a case of acute insanity upon his hands for two or three days or longer.—*Dr. Hitchcock in Medical Age.*

Colonic Lavage.

Dr. Milton H. Mack, in *The Chicago Medical Recorder*, January 15, 1904, discusses this subject in a sensible manner and points out (what seems to be generally unknown) its exceedingly great value in disease of the kidneys, and particularly in the cases in which there is suppression of urin. Dr. Mack commends colonic lavage particularly for chronic disease. He will find it almost equally valuable in nearly all acute inflammatory diseases.

Radium as a Generator of Electricity.

Curie has shown that radium is a constant generator of heat, and now Wien has shown that by a suitable arrangement radium may be made a constant source of electricity. Rutherford has shown that both positive and negative electrons are thrown off by radium, and since the size of the positive electrons is several hundred times greater than that of the negative electrons, all that is necessary to separate

them is a sieve which will allow the negative electrons to pass thru while it retains the positive electrons. Many substances are capable of acting as sieves in this way—for example, glass. Wien (*Phys. Zeit.*, September 1) enclosed radium bromid in a glass tube into which a platinum wire was fused, and the positive electricity collecting inside was drawn off by this wire. This tube was suspended by a glass thread in a larger tube into which a second platinum wire was melted. The current was found to be of the order of 3×10^{-12} amperes. The radiated masses of the electrons calculated from this current came out for the positive particles 4.6×10^{-17} gram per second, and 2.9×10^{-20} gram per second for the negative particles. It is, therefore, totally impossible to determine the radiated masses by weighing. The energy of radiation, owing to the high velocity of the particles, is considerable, being for the positive electrons 60 ergs per second, and for the negative 8.7 ergs per second, from four milligrams of radium bromide.—*London Electr. Review.*

Radium.

The *Medical Council*, of Philadelphia, in its December and January numbers, gives a good report of radium and its effects upon the human body.

X-Ray in Eye Diseases.

Dr. L. S. Downs, of Galveston, Tex., says *The Chicago Medical Times*, December, 1903, has demonstrated that the x-ray may be used with impunity for eye lesions. Injuries may be produced by too strong treatment. Three to five minutes is long enough for each treatment. He uses a moderately low tube and combines with it any other line of treatment that seems to be indicated.

Light Therapy in Eye Diseases.

H. Strebel (*Klinische-therapeutische Wochenschrift*, November 8, 1903) has shown that the ultraviolet rays are transmitted much more readily by the tunics of the eye than by the skin and mucous membranes, and that typical reactions are produced in the cornea, iris, and conjunctival mucous membrane. The employment of the rays in the treatment of various forms of conjunctivitis, keratitis, and iritis is thus suggested. Thus far the work has been entirely experimental in character, no therapeutic tests having been made.

Protection Against Rontgen Rays, and their Dosage.

Levy Dorn says that this question is constantly acquiring greater significance, and that undoubtedly legal restriction will soon be imposed on users of the Röntgen rays to prevent injury to those examined and treated. No satisfactory means of actual measurement has yet been devised, but every radiographer can make observations which will enable him to form an estimate of the power of his apparatus under the various modifications of current, frequency of interruption, distance of the tube, etc. The author's rule is that the safe maximum exposure is twenty times that used for radiographing the adult pelvis. For this the plate is usually sixty centimeters distant from the tube, but the skin of the patient only thirty centimeters, so that the skin receives four times the intensity of illumination that the plate does. If the exposure necessary is two minutes, the maximal exposures will be 20-4 of the time—that is, ten minutes. A similar calculation is to be carried out if the data should be different, bearing in mind that the intensity of the x-rays, like that of light, is inversely as the square of the distance. Owing to the cumulative effect of the rays,

during a space of fourteen days the aggregate of the exposures should not exceed one and one-half times the maximum. It must also be remembered that inflammatory affections of the skins render it more susceptible to the rays even after the inflammation has subsided, and that young persons, mucous membranes, the face and back of the hands react very easily. Precautions for the operator himself are important but difficult to carry out. The hand should never be used as test object, a wrapped-up bone answering every purpose, and plates of lead, gauntlets of tin foil and metal screens should all be used to protect the person from exposure.—*Deutsche medicinische Wochenschrift*, December 3, 1903.

X-Ray Prize Essays.—Believing that the further development of x-rays is of great importance to surgery and medicine and the human race, and to encourage research and disseminate the knowledge gained, the *Illustrated Review of Physiologic Therapeutics* offers the sum of \$1,500 in cash prizes for the best essays on x-rays in medicine and surgery, the first prize being \$1,000. All surgeons, physicians and hospitals interested in any branch of x-ray work should write to the *Illustrated Review of Physiologic Therapeutics*, 19 East Sixteenth street, New York City, for information concerning title, time allowed, conditions, etc.

The Degenerate Tonsil.

By Edwin Pynchon, M. D., (*J. A. M. A.*, March 21, 1903) commends very highly the electro cautery which he has used during the past twelve years for the removal of abnormal tonsillar tissue. Its advantages are a practically bloodless field, and no loss of the anesthetic. By the

cauterization there is destruction thereof should any portion of the follicular element escape the line of dissection. His results are ideal.

Removal of a Five-Cent Piece from the Esophagus.

Dr. A. D. L. Brokaw, of St. Louis, describes in the *Interstate Medical Journal* for November the removal of a nickel which had become wedged in a stricture of the esophagus of a child aged three. The x-ray was used to determine the exact position of the nickel.

Electricity for Blepharospasm.—Reuss found faradization of great value in photophobia due to mild cases of phlyctenular keratitis, and in cases in which lid-spasm persisted after the inflammatory symptoms had subsided. A single application often cured the blepharospasm.—*Alg. Wiener Med. Zeit.*, 1903.

Effects of Radium.—At a recent meeting of the Academy of Sciences in Paris, Dr. Roux of the Pasteur Institute presented a paper detailing the results of exposing mice continuously to the action of radium. He hung a tube of radium in a cage containing mice, and after twenty days the animals lost their fur, which subsequently came out again, but was white. Exposure for a still longer period resulted in the production of a general muscular paralysis.—*Medical Record*.

The "Iron Light" in Radio-Therapy.

Clasen has been favorably impressed with the action of the iron lamp, especially in acne and sycosis. Its effects are more superficial than those realized with the Finsen light, but his experience with

seventeen patients has shown that the new lamp, being within the reach of every practitioner can not fail to realize great progress in the treatment of cutaneous affections. For acne in particular it is the most convenient and agreeable method of treatment yet devised. In many cases in which the acne had persisted for years the skin healed over smooth after a few applications. He had only a single failure in his fourteen cases, and this one patient did not complete the course recommended. There are no subjective sensations from the application of the iron light. The lamp was designed by Dr. Bang, Finsen's first assistant, and is known as the Derma lamp.—*The Electro-Therapeutist*.

Jail for Doctor and Nurse.

Judge Biddle, in quarter sessions court No. 1, Philadelphia, Pa., sentenced Dr. Stanislaus Rosmus and Martha Divoranschick, a nurse, convicted of conspiracy in securing \$121 from Katie Zocharewitz, to two years each in the county prison.

The conspiracy consisted of representations made to Mrs. Zocharewitz to the effect that she was suffering from a complication of diseases. The sentence was received by the defendants with tears.—*Medico-Legal Bulletin*.

Prohibition as to Exhibitions of Hypnotism.

Chapter 219 of the Laws of Kansas of 1903 provides that any person who shall induce or permit any child under eighteen years of age to practice or assist or become a subject in giving public exhibitions of hypnotism, mesmerism, animal magnetism or so-called psychic forces shall be guilty of a misdemeanor, and on conviction be fined or imprisoned, or both.—*Medico Legal Bulletin*.

Finsen Light Treatment.

United States Consul R. R. Frazier, at Copenhagen, Denmark, has reported recently on the Finsen Medical Light Institute, of Copenhagen, which was established in 1886 by Prof. Niels R. Finsen. This is now a state institution, and 1,367 cases had received treatment up to May, 1903. A recently issued report, covering the first 800 cases of *lupus vulgaris*, showed that 51 per cent have been apparently cured, and that in 35 per cent of the cases the treatment has been satisfactory, and cure seems certain. In only 5 per cent has the treatment proved unsatisfactory. Nine per cent of the cases disappeared from observation.

The treatment consists in bathing the diseased surface with light from a special form of electric arc lamp. The method seems to be efficacious for most skin diseases, but less so for deep-seated cancers. —*Electrical Review*.

Treatment of Phthisis by High Frequency Currents.

Dr. Chisholm Williams reports forty-three cases of pulmonary tuberculosis, all of them over a year's duration. Forty-two of these increased in weight and lost all symptoms, excepting in a few cases where a slight cough remained and a few bacilli were occasionally found. The average time required for a severe case is three months, applications being made daily for the first month, every second day during the second month, and twice a week for the third. Those who possess a sufficient x-ray apparatus may adopt the treatment easily on procuring the necessary additional apparatus. Dr. Williams uses three methods, (1) auto-conduction, in which the patient is placed in a large solenoid; (2) auto-condensation, the patient lying on a couch; (3) the Oudin

resonator. He finds general treatment much better than local for tuberculous patients, and a combination better still.

Radium in Medicinal Springs.

Professor Dewar recently found that helium exists in the waters of Bath, Eng. Hon. R. J. Strutt, the son of Lord Rayleigh, has found minute quantities of radium in the deposits of these same waters, but not enough to pay for extraction.

A Singing Vacuum Tube.

William J. Hammer, of New York, in a letter to the *Electrical World and Engineer*, of January 2, 1904, describes a remarkable phenomenon which occurred in a Queen self-regulating x-ray tube, the target of which was recently perforated. A few days afterward a current was passed thru the tube until the anode became red hot. It was then laid upon a closed cardboard box, and suddenly a low but very clear musical note was given out from the tube, which could be felt to vibrate quite strongly. At other times the note did not begin when the tube was first laid down, but invariably a slight impulse would start it up. Sometimes it could be started two or three times without connecting to the coil. There was nothing near which could, so far as known, have caused the vibration, which lasted at different times from five to seventeen minutes. The writer suggests that the phenomena may be akin to the Trevelyan rocker or possibly to the air between the platinum and nickel plates of the anode. But referring to a London dispatch, which stated that a vacuum tube which had been lighted up continued to remain illuminated for ten days after its disconnection from the circuit, he suggests as a possible cause invisible ether radiations or waves.